

Tippecanoe River Watershed Restoration Action Strategy

Part II: Concerns and Recommendations

Prepared by

Indiana Department of
Environmental Management
Office of Water Quality

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Foreword

The Tippecanoe River Watershed Restoration Action Strategy (WRAS) is intended to be a living document to assist restoration and protection efforts of stakeholders in their sub-watersheds. As a "living document" information contained within the WRAS will need to be revised and updated periodically.

The first draft of the Tippecanoe River WRAS was released for public review during April 2001. This version of the WRAS incorporates public comments received during that time period.

The WRAS is divided into two parts: Part I, Characterization and Responsibilities and Part II, Concerns and Recommendations.

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Tippecanoe River Watershed Restoration Action Strategy

Part II: Concerns and Recommendations

Part II of the Watershed Restoration Action Strategy discusses the water quality concerns identified for the Tippecanoe River Watershed and lists recommended management strategies to address these concerns.

Part II includes:

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|-----------|---|
| Section 1 | Water Quality Concerns and Priority Issues Identified by Stakeholder Groups |
| Section 2 | Water Quality Concerns and Priority Issues Identified by State and Federal Agencies |
| Section 3 | Identification of Impaired Waters |
| Section 4 | Priority Issues and Recommended Management Strategies |
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1 Water Quality Concerns and Priority Issues Identified by Stakeholder Groups

The Tippecanoe River watershed contains potential stakeholder groups that have different missions. Many of these groups have a long history of working in the Tippecanoe River watershed. The following discussion briefly describes some of the watershed groups and lists their priorities and concerns.

Arrowhead Country Resource Conservation & Development Area, Inc.

The Resource Conservation & Development (RC&D) Area is a region where residents work to improve their environment and economy through conservation, development, and better utilization of natural resources. RC&D areas receive direct funding and technical assistance through the US Department of Agriculture Natural Resources Conservation Service, as well as other sources. The Arrowhead Country RC&D covers Newton, Jasper, White, Starke, Pulaski, Cass, Miami, Fulton, Marshall, and Kosciusko counties in northern Indiana. The Arrowhead Country RC&D conducts a river raft field day each year and is currently working on a septic assistance program for all the counties included in the RC&D. In addition, the Arrowhead RC&D is working with the White County Soil and Water Conservation District on erosion control/fish habitat and windbreak programs.

Lake Maxinkuckee

The Lake Maxinkuckee Environmental Council (LMEC) is a not-for-profit organization whose mission is the of protection and improvement of water quality in Lake Maxinkuckee. The LMEC works with such projects as fund raising, physical maintenance of the lake, treating stormwater runoff, wetland stewardship, and education campaigns.

Tippecanoe Environmental Lake & Watershed Foundation

The Tippecanoe Environmental Lake & Watershed Foundation (Foundation) led by an eleven member Board of Directors. In 1999, the Foundation established an office and hired a Coordinator. The Foundation has numerous ongoing restoration and water quality monitoring projects located in the upper portion of the Tippecanoe River watershed.

Shafer-Freeman Lakes Environmental Conservation Corporation

The Shafer-Freeman Lakes Environmental Conservation Corporation (SFLECC) is a "grass-roots" organization focused on the restoration and protection of Lakes Shafer and Freeman. The SFLECC controls over 2000 acres of land immediately around and under both reservoirs. An immediate concern of the SFLECC is the preservation of recreational, environmental, and financial qualities of the reservoirs.

Northern Indiana Citizens Helping Ecosystems Survive (NICHES)

NICHES is a private land trust working in Tippecanoe, Benton, Carroll, Clinton, Fountain, Montgomery, and Pulaski counties. The primary focus of NICHES is the preservation of natural land and significant natural areas. More information about NICHES can be obtained by visiting <http://www.dcw.com/~niches/>.

The Nature Conservancy

The Indiana Chapter of The Nature Conservancy (TNC) has designated the Tippecanoe River as a priority site for conservation action. Due to the size and diversity of the watershed, TNC decided to break the watershed into smaller parts in order to ease some of the start-up problems associated with planning and implementation. Since the upper end of the river is rich in fish and unionid fauna and diversity, TNC started their efforts there, with the goal of working their way downstream as the project matured. TNC is targeting an area encompassing roughly 100 river miles in the upper reaches of the watershed. TNC chose not to include the areas upstream of the upper reservoirs because the reservoirs themselves are settling basins that enhance water quality downstream. Furthermore, most of the tributaries north of the lakes are dredged streams, supporting disparate unionid life and fish communities. Finally, the recreational value of the reservoirs has led to the existence of programs designated to control point and non-point source inputs to the reservoirs to maintain the recreational value.

Since TNC's project is in the beginning phases, one of the main priorities is to develop a citizen advisory group comprised of stakeholders from the watershed area. This group can help identify threats to the system, and unique natural areas that are locally specific and be otherwise unknown. This group will also help to develop "community friendly" strategies to abate local environmental threats, and work as an "on-the-ground sales force" for both the project, and TNC. TNC is also working in the watershed to foster relationships with potential project partners such as the county Soil and Water Conservation Districts and the state and federal natural resources agency personnel that work in the watershed. TNC is educating the public on the national significance of the river by talking to civic groups and holding field days and informational sessions to highlight the watershed's unparalleled diversity.

Due to the size of this watershed, it is unreasonable to think that any one group with limited staff and resources can make an appreciable difference in positively affecting the watershed and river. For that reason, one of TNC's our long-term strategies will be to coordinate with other groups to undertake land-based conservation efforts aimed at the preservation of species.

TNC feels that their best role is maintaining the conservation momentum in the watershed, and working to inspire others to assist us in the mission, thereby multiplying the overall impact in the watershed and extending the reach of the project.

Another priority of the TNC project is to develop a monitoring program that will help develop a basis for determining long-term ecological trends in the Tippecanoe River. This will help develop strategies that will possibly lead toward abating the known environmental threats. TNC has established seven (7) monitoring stations on the River that represent a wide cross section of habitat types, river stretches, substrates, Natural Regions and transitional areas between Natural Regions. The information obtained from these seven sites will serve as a barometer of stream health in those particular areas, and provide the information needed to create adaptive solutions to ecological trends in the system. TNC plans to inventory some of the larger tributaries to the river that have high quality habitat for fish and mussel species. It is TNC's hope that, if some conservation work were done in these smaller watersheds, they can be developed into refuges for species in the event of a catastrophic event on the main river.

TNC's overall goal is build relationships with local landowners and conservation-minded agencies in order to work with them to adopt and promote more Earth friendly land use practices, and work towards developing and promoting more "sustainable" forms of agricultural practices that would be more widely adopted in the watershed. TNC will work with the property owners directly along the river's riparian corridor; working toward making land use changes that will benefit the river and its species through such strategies as tree plantings and buffering practices along the open agricultural drains. TNC is striving to build relationships with potential project partners and working toward establishing TNC as a natural resources leader and information/technical assistance source in the watershed. TNC is also working toward developing success stories in the watershed that can be used as a foothold to gain trust and credibility with local landowners and decision makers.

2 Water Quality Concerns and Priority Issues Identified by State and Federal Agencies

This section presents the combined efforts of state and federal agencies, and universities (such as IDEM, IDNR, USDA-Natural Resources Conservation Service, Ohio River Valley Water Sanitation Commission, Purdue University, Indiana University, Indiana Geologic Survey, and US Geological Survey) to assess water quality concerns and priority issues in the Tippecanoe River Watershed. This multi-organization effort formed the basis of the Unified Watershed Assessment for Indiana. At this time, the Unified Watershed Assessment has been completed for 1998 and updated for 2000-2001.

Indiana's Unified Watershed Assessment (UWA)

The UWA workgroup gathered a wide range of water quality data that could be used to characterize Indiana's water resources. These data were used in 'layers' in order to sort the 8-digit HUC watersheds according to the present condition of the water in lakes, rivers, and streams. The workgroup used only those data which concerned the water column, organisms living in the water, or the suitability of the water for supporting aquatic ecosystems. Each 'layer' of information/data was partitioned by percentiles into scores. The scores ranged

between one and five, with a score of one indicative of good water quality or minimum impairment, and a score of five indicating heavily impacted or degraded water quality.

The data layers used in the 1998 and the 2000-2001 update include:

- ◆ Lake Fishery: Large mouth bass community information for lakes
- ◆ Stream Fishery: Small mouth bass community information for streams
- ◆ Aquatic Life Use Support: The "livability" of the water column for aquatic life, determined from evaluation of chemical and physical water data, and assessment of aquatic life
- ◆ Fish Consumption Advisories: Site specific advisories based on current data
- ◆ Fish Index of Biotic Integrity: Based on fish community diversity and fish health
- ◆ Qualitative Habitat Evaluation Index: Measure of whether the aquatic habitat is suitable for diverse communities, based on visual observations
- ◆ Lake Trophic Scores: Indicator for the rate at which a lake is 'aging' due to inputs of nutrients and other factors
- ◆ Sediment Potential: Indicator of potential sediment input to waterbodies in the watershed

The sources and additional information for these data layers include:

- ◆ Lake Fishery: From IDNR fisheries surveys of lakes and reservoirs from 1972 to 1994. Raw scores were averaged for all lakes in the watershed
- ◆ Stream Fishery: From IDNR fisheries surveys of streams from 1970 to 1994. Raw scores were averaged for all streams in the watershed
- ◆ Aquatic Life Use Support: IDEM, Office of Water Quality, Assessment Branch
- ◆ Fish Consumption Advisories: ISDH and IDEM, Office of Water Quality, Assessment Branch
- ◆ Fish Index of Biotic Integrity: IDEM, Office of Water Quality, Assessment Branch
- ◆ Qualitative Habitat Evaluation Index: IDEM, Office of Water Quality, Assessment Branch
- ◆ Lake Trophic Scores: Indiana Clean Lakes Program through IDEM, Office of Water Quality, Assessment Branch. This score was based on information gathered from sampling conducted in the 1970's and 1980's

During summer 1999 the UWA workgroup used additional layers of information to identify the **resource concerns and stressors** for each of the 361 11-digit watersheds in Indiana. Examination of the human activities that have the potential to impact the ecosystem will help planners to focus on those areas where restoration may be most critical. Organizations can identify opportunities to use their programs and resources to address those areas.

This focusing process will illuminate areas where the interests of two or more partner agencies may converge. It is intended that this will lead to more effective allocation of resources for restoration and protection activities. At the local level, this information can assist groups to prioritize watershed activities and provide some discussion points for planning.

This amended assessment has the following benefits:

- ◆ Provides a logical process for targeting funds, which may be expanded or updated without changing the basic framework.

- ◆ Provides information at a finer resolution (11-digit hydrologic units) to agencies and local groups interested in watershed assessment.
- ◆ Identifies data gaps.
- ◆ Can be used as a compliment to other assessments, such as the 305(b) Report and 303(d) List.

Table 2-1 and Figure 2-1 show the results of the 2000-2001 UWA for the Tippecanoe River watershed.

3 Identification of Impaired Waters

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Indiana's 303(d) list was approved by EPA on February 16, 1999.

Once the Section 303(d) list and ranking of waters is completed, the states are required to develop Total Maximum Daily Loads (TMDLs) for these waters in order to achieve compliance with the water quality standards. The TMDL is an allocation that determines the point and nonpoint source (plus margin of safety) load reductions required in order for the waterbody to meet water quality standards. IDEM's Office of Water Quality has and continues to perform point source waste load allocations for receiving waters. Part I of the WRAS briefly outlines IDEM's strategy for developing TMDLs.

The following Tippecanoe River Watershed waterbodies are on Indiana's 1998 Clean Water Act Section 303(d) list submitted and approved by EPA 303(d) list (Figure 3-1):

| Water Body | Location/Reach | County | Parameter(s) of Concern | HUC | Subwatershed(s) |
|------------------|----------------|------------------------------|-------------------------|---------|----------------------------|
| Crooked Lake | Burr Oak | Noble / Whitley | FCA for Hg | 5120106 | 10 |
| Center Lake | Warsaw | Kosciusko | FCA for PCB | 5120106 | 20 |
| Lake Manitou | Rochester | Fulton | FCA for Hg | 5120106 | 50 |
| Lake Maxinkuckee | Culver | Marshall | FCA for Hg | 5120106 | 61 |
| Pike Lake | Warsaw | Kosciusko | FCA for Hg | 5120106 | 20 |
| Tippecanoe Lake | Oswego | Kosciusko | FCA for Hg | 5120106 | 10 |
| Tippecanoe River | Rochester | Fulton | Cyanide | 5120106 | 50 |
| Tippecanoe River | All | Kosciusko / Fulton / Pulaski | FCA for PCB & Hg | 5120106 | 020 030 040 050 060 080 |
| Winona Lake | Warsaw | Kosciusko | FCA for PCB | 5120106 | 20 |

FCA - Fish Consumption Advisory

PCB - Polychlorinated Biphenyls

Hg - Mercury

***Only waters for which fish tissue data support issuance of fish consumption advisories are individually cited above.

The Indiana Department of Health has issued a general fish consumption advisory for all other waters of the state.

This advisory was based on extrapolation of the fish tissue data that were available and generally recommends that if no site-specific advisory is in place for a waterbody, the public should eat no more than one meal (8 oz.) per week of fish caught in these waters. Women of child bearing age, women who are breast feeding, and children up to 15 years of age should eat no more than one meal per month. The basis for this general advisory is widespread occurrence of mercury or PCBs (or both) in most fish sampled throughout the state. Please refer to the most recent Fish Consumption Advisory booklet available through the Indiana Department of Health (317/233-7808). Sources of the mercury and PCBs are unknown for the most part, but it is suspected that they result from air deposition.

4 Priority Issues and Recommended Management Strategies

Part I provided the existing water quality information for the Tippecanoe River watershed and Part II lists priority issues and concerns from local, state, and federal stakeholders in the watershed. This section pulls together the priority issues and concerns held by all stakeholders and recommends management strategies. Underlying all discussions of priority issues and concerns is the fact that improving water quality in the Tippecanoe River Watershed will also enhance the natural and recreational values of Tippecanoe River. Each subsection below focuses on a single priority issue.

4.1 Data/ Information and Targeting

The success in restoring water quality in the Tippecanoe River Watershed is fundamentally based on identifying the specific geographic problem areas; identifying all sources contributing to the impairment of the waterbody; and quantifying the contribution of a pollutant by each source.

Recommended Management Strategy 1: Numerous data collection efforts are ongoing in the Tippecanoe River Watershed. This information should be used in prioritizing and targeting specific problems and geographic areas in the watershed. The scale at which targeting and prioritization should occur is the 14-digit HUC watershed area (Figure 2-2 of Part I). Targeting and prioritization will require input from stakeholders living in those geographic areas. The purpose of prioritization and targeting is to enhance allocation of resources in the effort of improving water quality.

Recommended Management Strategy 2: Through the development of Total Maximum Daily Loads (TMDLs) for impaired waterbodies in the Tippecanoe River Watershed, all sources contributing to the impairment of a waterbody will be identified and quantified in terms of their contribution to the waterbody. This includes gathering more data and information on nonpoint sources of water pollution. Throughout the TMDL process, information and feedback from watershed stakeholders will be required in order to generate appropriate allocation scenarios. The result of developing TMDLs will be an understanding of the impact of nonpoint sources on water quality in the watershed.

4.2 Streambank Erosion and Stabilization

The cutting and erosion of streambanks within the Tippecanoe River Watershed is a major concern. This cutting and erosion increases the sediment load in waterbodies and directly impacts the scenic and recreational values of waterbodies in the Tippecanoe River Watershed. Streambank cutting and erosion is often a function of many factors that include: stream energy and velocity, flooding, and land management. Increased drainage in headwater streams and ditches increases stream energies during rainfall events and often leads to increased streambank cutting and erosion downstream. Land clearing and urban development also impact volume and velocity of runoff. Hence, this problem is not easily solved.

Recommended Management Strategy 1: Structural stabilization of specific streambank areas in the Tippecanoe River watershed may solve problems on a temporary basis. However,

a comprehensive understanding of drainage, stream flows and energies, and land management practices is required to adequately approach this problem. Conservation partners (local, state, and federal) are actively working within their specific geographic areas (typically at the county level); however, this may not facilitate solving the streambank cutting and erosion problems because efforts may not be coordinated between headwater and downstream areas. For example, drainage should take into account the work and efforts of downstream partners to reduce flooding and streambank cutting. Conservation efforts should be in the context of watersheds and span county boundaries in order to account for downstream impacts. Local Drainage Boards, Planning and Zoning Boards, and County Commissioners could effectively address this issue by involving local stakeholders in the decision making process and approaching the issue on a watershed basis.

4.3 Failing Septic Systems and Straight Pipe Discharges

Local county health departments and other stakeholders have identified failing septic systems and straight pipe discharge from septic tanks as significant sources of water pollution in the Tippecanoe River watershed. Straight pipe discharges from septic tanks and septic tanks connected to drainage tiles are illegal (327 IAC 5-1-1.5); however, these practices still exist in the Tippecanoe River watershed.

Recommended Management Strategy 1: The direct impact of communities discharging their septic tank effluent to waterbodies needs to be adequately characterized. This will involve coordination between the Office of Water Quality, local health departments, Indiana State Department of Health, and other stakeholders. The option of choice to eliminate the illegal discharges will be a cooperative effort between homeowners and local, state, and federal stakeholders.

Recommended Management Strategy 2: Local planning, zoning, and health ordinances could be adopted or strengthened to address this problem during new development. Existing local ordinances could be enforced more vigorously to correct problems with existing systems. Both of these strategies will require input from local stakeholders.

Recommended Management Strategy 3: An education/ outreach program on the health and environmental risks of septic system discharges, system maintenance, and system function would provide homeowners and others with basic information to better understand the impacts of inadequate systems. This kind of education effort would involve local health departments, Indiana State Department of Health, IDEM, and other stakeholders. The ArrowHead RC&D is working on a project to demonstrate proper septic system installation.

4.4 Water Quality - General

The Clean Water Act Section 303(d) list presented in Section 3 lists impaired waterbodies for the Tippecanoe River watershed.

Recommended Management Strategy: The Clean Water Act requires states to complete TMDLs for waterbodies listed on the Section 303(d) list. The Office of Water Quality is currently evaluating and exploring the modeling process and data needs required to complete TMDLs for the Section 303(d) listed waterbodies. Completion of a TMDL will involve loading allocations of a pollutant to both point and nonpoint sources. The development of TMDLs will involve meetings with stakeholder groups linked to the Section 303(d) waterbodies. As TMDLs are

developed, this Watershed Restoration Action Strategy will be amended to incorporate the final TMDLs.

4.5 Fish Consumption Advisories

As noted in Part I and Part II, fish consumption advisories are concerns within the Tippecanoe River watershed.

Recommended Management Strategy 1: In many cases, the source of the contamination is unknown and may be from atmospheric deposition or some unknown discharge. To address this concern, the cause or source must be identified. Until that is accomplished, the fish consumption advisories should be followed.

4.6 Nonpoint Source Pollution - General

Nonpoint source pollution contributions are often difficult to assess or quantify. They can include sediment deposition from soil erosion, nutrient runoff from animal wastes and commercial fertilizer, herbicide and insecticide runoff, and oil or fuel waste runoff. Nonpoint pollution can emanate from agricultural as well as urban lands. Currently, loadings of nonpoint source pollutants to water are often inferred by examination of land use practices, without actual measurements. In addition, the actual water quality impairments related to nonpoint source pollutants have not been well characterized in the Tippecanoe River watershed. Finally, very few regulatory control mechanisms exist to control nonpoint source pollution.

Recommended Management Strategy 1: Through the TMDL development process, the Office of Water Quality will identify, assess, and quantify nonpoint source pollutant loadings to impaired waterbodies. In order to accomplish this task, the Office of Water Quality will work closely with local, state, and federal stakeholders at the watershed and subwatershed level. Loading scenarios for nonpoint source pollutants will be developed by the Office of Water Quality and reviewed by local, state, and federal stakeholders. Implementation of nonpoint source controls will involve a blend of funding assistance and regulatory action, where applicable.

Recommended Management Strategy 2: Numerous funding mechanisms, such as Conservation Reserve Program, Environmental Quality Incentive Program, Lake and River Enhancement program, and 319(h) grants, exist to promote practices to reduce nonpoint source pollution in the watershed. To more efficiently and effectively address nonpoint source pollution in the watershed, the prioritization and targeting discussed previously in Part II should be used to allocate further application of resources.

Recommended Management Strategy 3: The management of urban nonpoint sources can be addressed through effective land use planning and site design. Designs that incorporate less impervious area and more natural infiltration areas have proven effective in reducing urban nonpoint pollution. Local stakeholders working with local planning and zoning authorities, and developers, should implement more stringent site design requirements to reduce nonpoint source contaminants. This effort would be supported by the state and federal stakeholders.

4.6.1 Nonpoint Source Pollution- Education and Outreach

This Watershed Restoration Action Strategy is a beginning point for education and outreach efforts. It compiles existing knowledge about the water resource in this watershed and presents it to the stakeholders who live in the Tippecanoe River. It brings to a public forum the available information and local concerns. However, the education process does not stop with the publication of this document.

Recommended Management Strategy: Local stakeholders, in cooperation with state and federal agencies, need to seek additional information on water quality concerns and issues addressed in this document and make that information available to the public. Additionally, the problems associated with septic failures, soil erosion, land use issues, and riparian zones can be emphasized through meetings, training sessions, and stakeholder group discussions. Field days are excellent ways to present information and encourage discussion. Use of experts with strong background knowledge coupled with local sponsors is an effective method to convey solutions to these problems.

4.7 Point Sources - General

There are 96 active NPDES permitted dischargers, and 15 CSO discharge points in the Tippecanoe River watershed. Additionally there are illegal point source discharges, such as tiles discharging septic tank effluent that exist in the watershed.

Recommended Management Strategy: The Permitting and Compliance Branch of the Office of Water Quality is responsible for issuing and monitoring compliance of NPDES permit holders. Clearly, more emphasis and resources are needed to identify and correct illegal point sources and noncomplying point sources. Improving compliance of NPDES dischargers and identifying illegal dischargers will involve fostering a working relationship with other local, state, and federal stakeholders to monitor compliance and report unusual discharges or stream appearance. In regards to illegal discharges, the Office of Water Quality will work with local, state, and federal stakeholders to identify and eliminate these sources of water pollution.

5 Future Expectations and Actions

As discussed in Part I, this Watershed Restoration Action Strategy is intended to be fluid document that will be revised or amended as new information becomes available. Section 5.1 discusses expectations derived from the Strategy and how progress will be measured. Specific revisions and amendments to the Watershed Restoration Action Strategy are discussed in Section 5.2. Finally, the Watershed Restoration Action Strategy will be reviewed by all stakeholders before it becomes final, as described in Section 5.3.

5.1 Expectations and Measuring Progress

The Tippecanoe River Strategy provides a starting point to address water quality concerns held by local, state, and federal stakeholders. Part II provides recommended management strategies to address these concerns. Through cooperative efforts with stakeholders, all of the recommended management strategies listed will begin implementation by the summer of 2002.

Measurement of progress is critical to the success of any plan. Water quality improvements will not take place overnight. Measuring of progress in terms of water quality will be provided through the Office of Water Quality Assessment Branch's rotating basin monitoring strategy.

5.2 Expected Revisions and Amendments

This Watershed Restoration Action Strategy is intended to provide a starting point to improve water quality and measure the improvement. Hence, this document will require revisions and amendments as new information becomes available. The future revisions and amendments have been divided into those that are expected within the next year (Section 5.2.1) and those that will occur over a long-term basis (Section 5.2.2).

5.2.1 Short Term Revisions and Amendments

The most significant revisions and amendments will likely occur during 2001 and after, as a result of stakeholder review.

5.2.2 Long Term Revisions and Amendments

The Office of Water Quality is moving toward adopting a watershed management approach to solve water quality problems. Part of the watershed approach is the use of a rotating basin management cycle. The Assessment Branch of the Office of Water Quality has already adopted this rotating basin cycle in its intensive monitoring and assessment of Indiana waterbodies (this is in addition to the already established fixed monitoring station monitoring which occurs on a monthly basis). The Watershed Restoration Action Strategy may be revised or amended when sufficient information becomes available.

5.3 Review of the Watershed Restoration Action Strategy

Before this Watershed Restoration Action Strategy becomes final, it will undergo rigorous review. The first stage of review will be performed internally by the Office of Water Quality. Once the Watershed Restoration Action Strategy has been revised to address internal Office of Water Quality comments, it will be circulated to local, state, and federal stakeholders in the watershed. Written comments from local, state, and federal stakeholders will be addressed and the Watershed Restoration Action Strategy will again be revised to incorporate applicable comments. Once internal and external comments have been addressed, the final version of the Watershed Restoration Action Strategy will be released.

Table 2-1

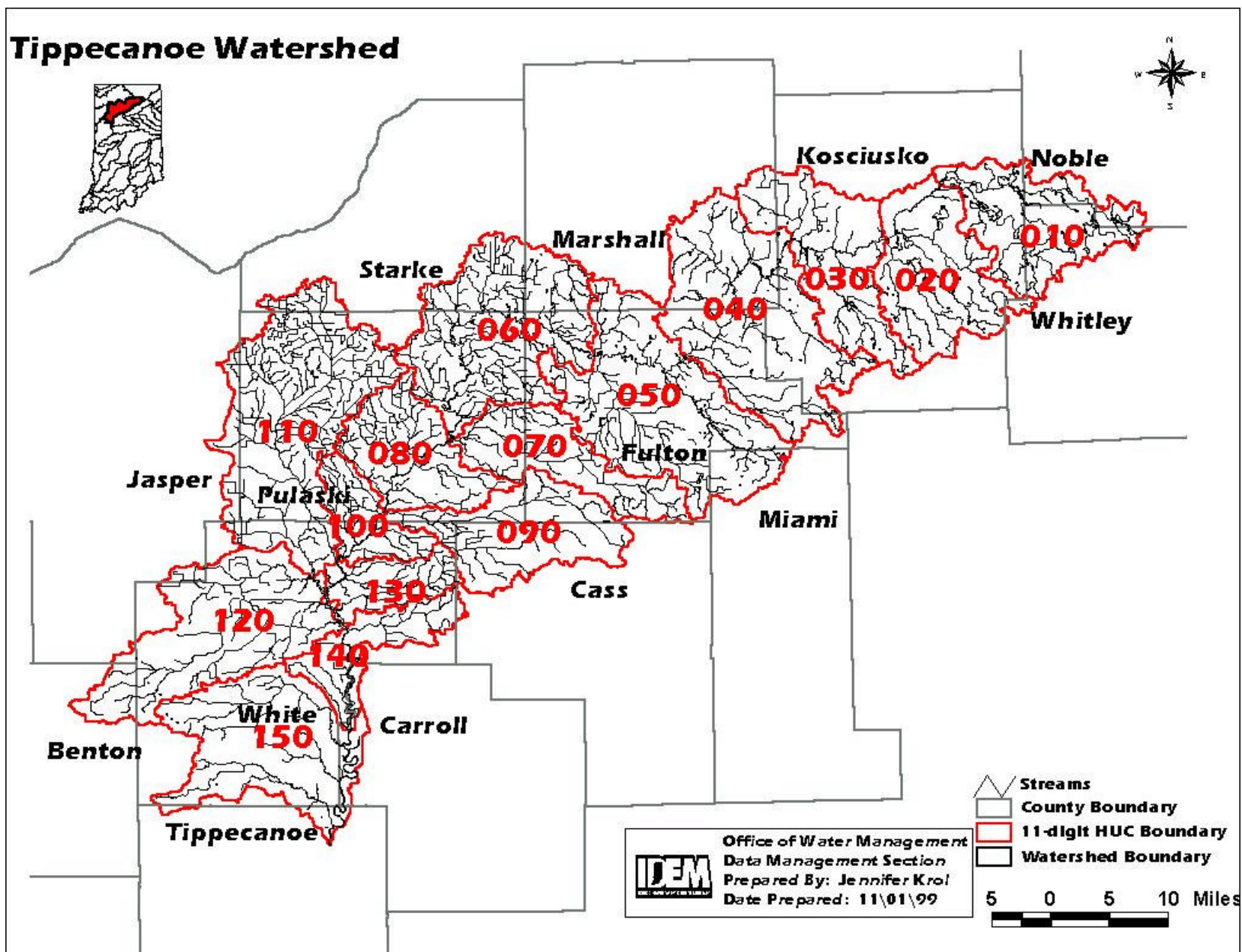
| HYDROLOGIC UNIT SCORES for Each Parameter Used in the Unified Watershed Assessment [2000-2001] | | | | | | | | | | | | | | | | |
|--|-------------|---------------------------------|--------------------------|-----------------------------|----------------|--------------|-------------------------------------|---------------------|--------------------------------|-----------------------|---|-----------------------------------|------------------------|----------------------|------------|-------------------------------|
| 11 Digit Hydrologic Unit | | Mussel Diversity and Occurrence | Aquatic Life Use Support | Recreational Use Attainment | Stream Fishery | Lake Fishery | Eurasian Milfoil Infestation Status | Lake Trophic Status | Critical Biodiversity Resource | Aquifer Vulnerability | Population Using Surface Water for Drinking Water | Residential Septic System Density | Degree of Urbanization | Density of Livestock | % Cropland | Mineral Extraction Activities |
| Tippacanoe | 05120106010 | 5 | nd | nd | nd | 2 | 3 | nd | 5 | 3 | 2 | 5 | 2 | 5 | 3 | 1 |
| | 05120106020 | 5 | nd | nd | nd | 4 | 4 | 1 | 5 | 3 | 2 | 5 | 2 | 5 | 3 | 1 |
| | 05120106030 | 5 | nd | nd | nd | nd | nd | 2 | 3 | 2 | 2 | 4 | 2 | 5 | 3 | 1 |
| | 05120106040 | 5 | nd | nd | nd | 2 | 3 | 3 | 4 | 2 | 2 | 3 | 2 | 4 | 4 | 1 |
| | 05120106050 | 5 | nd | nd | nd | 3 | 4 | 3 | 4 | 2 | 2 | 2 | 2 | 3 | 4 | 1 |
| | 05120106060 | 5 | nd | nd | nd | 4 | 4 | nd | 5 | 2 | 2 | 3 | 2 | 3 | 4 | 1 |
| | 05120106070 | 5 | nd | nd | nd | nd | nd | nd | 2 | 2 | 2 | 1 | 1 | 3 | 4 | 1 |
| | 05120106080 | 5 | nd | nd | nd | nd | nd | 3 | 4 | 2 | 2 | 1 | 2 | 2 | 5 | 1 |
| | 05120106090 | nd | nd | nd | nd | 3 | nd | nd | 2 | 2 | 2 | 2 | 1 | 3 | 4 | 1 |
| | 05120106100 | 2 | nd | nd | nd | nd | nd | nd | 2 | 2 | 2 | 4 | 1 | 3 | 5 | 1 |
| | 05120106110 | nd | nd | nd | nd | nd | nd | nd | 4 | 2 | 2 | 1 | 2 | 3 | 5 | 1 |
| | 05120106120 | nd | nd | nd | nd | nd | nd | nd | 3 | 2 | 2 | 1 | 2 | 3 | 5 | 2 |
| | 05120106130 | nd | nd | nd | nd | nd | nd | 2 | 2 | 2 | 2 | 4 | 1 | 3 | 5 | 2 |
| | 05120106140 | nd | nd | nd | nd | 5 | nd | 3 | 2 | 2 | 2 | 4 | 2 | 3 | 5 | 2 |
| | 05120106150 | 5 | nd | nd | nd | nd | nd | nd | 5 | 3 | 2 | 3 | 2 | 3 | 5 | 2 |

Note:

The UWA scores range from 1 to 5, with a score of 1 indicating good water quality and a score of 5 indicating severe impairment.

Nd = No data

Figure 2-1



**Figure 3-1
Clean Water Act
Section 303(d) Listed Waterbodies**

